

other fundamental defects, because that theory was for a while accepted as a simple and welcome explanation of the genesis of ore-deposits, and began to hinder the progress of knowledge on that subject.

It found many disciples, especially among mineralogists, because it permitted the most extensive genetic generalisations, without requiring the observer to leave his mineral collection and laboratory, to descend into the mine, and to study the ore in the place of its origin. On the other hand, it must be confessed that the promulgation of this theory led to many investigations of rocks, which will be useful to science in other directions.

Sandberger, being convinced that he had detected foreign admixtures of the metals in silicates, felt himself warranted in explaining by his theory all ore-deposits in the silicate rocks; but he could not so well deal with those in limestone, which were cited by Stelzner as a chief argument against the universality of his conclusion. With regard to Raibl, in Carinthia, it occurred to him to examine the marly slates overlying the limestone; and finding in these, besides traces of Li, Cr, and Cu, more considerable quantities of Pb and Zn, he concluded that the metals in the ore-channels of the limestone under these slates had been leached out of the latter. This was already a descending, and not a lateral, secretion.

Dr. Sandberger submitted a statement or compilation, from which it appeared that he attached less importance to the analysis of the eruptive rocks than to that of the stratified rocks, composed of the detritus of the central Bohemian gneiss mass. According to this view, the metals of the Przibram veins came from the mica of the gneiss detritus. According to Dr. Sandberger, however, the investigation disclosed that "an essential part of the lead and silver contents of the ore-veins is due to the eruptive rocks"—which involves a modification of the above theory. This led Professor A. Stelzner in Freiberg to make a thorough test of the means employed, which showed that Sandberger's method cannot decisively determine whether the metals detected in the silicate were original constituents, or whether they are not secondary impregnations, left undissolved by the reagents employed.

It is thus rendered probable that minute metallic admixtures detected in the country-rock by Sandberger's method are really derived from the ore-deposit, *i.e.*, are not idigenous but xenogenous. His assumptions in this field also are thus shown to be indefensible.

While fully acknowledging the great importance of chemical data for the explanation of vein phenomena, a description of a theory of ore-deposits based upon purely chemical grounds, which has just been made public by De Launay, will not be out of place. The author starts chiefly from the views of Elie de Beaumont concerning volcanic and metallic emanations, adding to these the results of the studies of Fouqué, Senarmont, Ebelmen, St. Claire Deville, Daubrée, &c. He begins with the primitive occurrence of magnetite in the eruptive rocks, which he extends to many other metals and minerals whose primitive presence in eruptives has not been demonstrated. Certain metallic substances were segregated in cooling from the molten mass; others have been dissolved from the eruptive rock in depth by "mineralisers," such as emanations of chlorine, fluorine, sulphur, &c., and have been deposited in the channels leading to the surface. De Launay is a very positive ascensionist; he also doubts the primitive deposition of ores in marine basins, and thus comes by the path of chemical speculation to results analogous to mine. Volcanic and ancient eruptive rocks; fumaroles and mofettes; geysers and thermal springs—these indicate the ways by which the metals have reached the earth's surface. But of such assumptions we must obtain assurance through observations in other directions. Views based upon purely chemical conclusions are not sufficiently convincing for us, because they are gained in the chemical laboratory under conditions different, especially as to pressure and temperature, from those which obtain in the deep region.

Manner of Filling of Open Spaces in General.

We know already that cavities, however originated, are always filled in analogous ways. We find in vein-spaces, in the spaces of dissolution, and even in individual geodes of opal and chalcodony, always the same elements of structure, though in the most widely different materials.

Considering the matter closely, we find that many things are peculiar to the shallow region, as the nearest to atmospheric influences; but some things experienced in that region may be used to explain the phenomena of deposits in the deep region also.

Since we have seen that the precipitate in an approximately horizontal pipe, entirely filled with liquid, attaches itself to the whole interior surface, the same must be true for an underground channel, and all the more if it approaches a vertical position. Under such circumstances the deposit or mineral crust will cover uniformly the whole wall-surface.

Evidently the same laws govern here as in sedimentation. When the section of the passage through which the liquid flows under a given pressure is relatively small, the deposit will take place only when the passage is enlarged. This explains the sometimes unequal distribution of ore in one and the same mineral-water channel.

As in a saturated solution a precipitate may be obtained upon any solid body introduced, so in our mineral-water channels deposits will be made upon all solid bodies—splinters or masses of rock fallen into the fissure, loose pieces of older mineral crusts, and individual crystals floating in the liquid.

The size of the rock-fragments here considered is very variable. We might include, for instance, those which are inclosed between two regular vein-branches. But we will narrow our view to what can be seen from a single standpoint in the mine, and then we observe that "horses" of several square metres' surface are uniformly crusted, like small pieces of country-rock found in the vein-filling, the only difference being, perhaps, that the crusts are thicker and more numerous upon the larger masses. The fragments of rock, either angular or already more or less rounded, form, when incrustated, the so-called sphere-, cocarde-, or ring-ores. Crusted rock-kernels may often be observed coexisting with distinct wall-crusts. Sometimes the latter are less prominent than the former, and the ore-deposit then has the appearance of a breccia or a conglomerate, the several